

Director of INNOVATION

Innovation Beyond Imagination

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OPEN INNOVATION



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FISHING FOR GREAT IDEAS? TO BE A TRULY INNOVATIVE ORGANIZATION YOU NEED MORE THAN A NET!

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The Navy, like most other large organizations today is increasing the drumbeat for innovation. Innovation is not only a top priority for the current Chief of Naval Operations, a recent IBM survey places it as a top priority for the majority of fortune 500 CEOs. The reasons are both obvious and compelling. Companies in the private sector are facing escalating costs, unpredictable economic environments, and technology that is increasing at the speed of light. Just when a company thinks it has invented the best mouse trap someone comes around the corner with a better one. Our military is also facing a turbulent geopolitical landscape, huge pressures on cost reduction, and an enemy that is exceedingly clever and often uses very low-tech weaponry.

All of us who have tried to introduce and then implement something different understand that innovation is an easy word to say but a hard thing to do. In fact, many large and established organizations are often innovation killers despite their best intentions. Suffocating bureaucracy, risk aversion, control systems out of control, the “not invented here” syndrome, slavish cost cutting, and idea censorship are a few of the causative factors for the failure of many innovative initiatives.

But some large organizations – including military ones – have succeeded in inducing greater innovation despite the odds that are

often stacked against them. While there is still no prescriptive code for innovation like there is for Lean Six Sigma, certain trends and enablers are starting to emerge as common across some of the winners.

- 1. *A tool not a destination:*** One of the biggest mistakes that organizations make in pursuing innovation is that they see and talk about innovation as a destination, not a tool for accomplishing something. We often ask our clients what they want more innovation to do for them. What is the desired effect? It’s amazing to us how many CEO’s and top level leaders struggle with the answer to this question. Do you want better products and services, or creative cost cutting ideas, or an organization that is much more nimble and agile, thus being able to react to a competitive threat or a hostile act? Failing to specify the tool’s use often leads to vague and undifferentiated understanding of the concept and a lot of uncoordinated initiatives. Innovation winners are clear about the tool’s purpose and, thus, know how to structure things around the tool to make its use both effective and efficient. Intel, for example, is in the chip business and while they innovate in the chip space, the real use of the tool is to work with partners and electronics manufacturers to create products that use more of their chips.

- 2. A clearly articulated strategy:** If you understand what you are using the tool for then you have already begun to develop an articulated innovation strategy. Successful innovators have spent more than a few hours trying to articulate exactly what they want from innovation and then create structures, processes, values, and incentives so that the innovation strategy actually gets implemented. The United States Coast Guard (CG), for example, has an innovation strategy and an “Innovation Council” staffed with Commander and Captain level personnel who have shown an entrepreneurial orientation. Then they tell the commanders of these folks that Innovation Council members are required to spend 60-70% of their time pursuing entrepreneurial opportunities within the CG. Higher ups in the chain of command step in personally if the entrepreneur’s direct superior tells them to “get back to work and forget about all this innovation nonsense.”

The Navy has just stood up its own innovation council called the Innovation Council of Captains (ICOC) for the explicit purpose of aiding new concept generation and development for battlefield superiority.

Without a strategy, an organization is very much on the road that Alice in Wonderland took when she reached a fork in the road and encountered the Cheshire cat. When she asked the cat for directions as to which path to take he asked where she was headed. She responded that she did not know as she was lost. “Then either road will do,” he replied. That is sage advice for any organization trying to be more innovative. If you don’t know your destination then any path is as good as another.

- 3. Allowing serendipity and fostering creativity:** People who do the same thing and talk with the same people about the same topics day after day tend to become stale in their thinking. In contrast, people who interact within a broader and more diverse community, who feel safe sharing new ideas, and whose organizational culture encourages brainstorming and

experimentation – they tend to be more creative and better able to innovate.

Serendipity involves the discovery of something valuable when you aren’t looking for it, and it tends to occur around coffee pots and other places where people run into each other and chat. These brief discussions can spark creative ideas either by triggering new solutions to problems or by triggering new ways of seeing a process or a problem. Organizations that empower people to share and build on each other’s unconventional ideas provide an environment where creative serendipity can be funneled into actionable plans.

- 4. Entrepreneurship: Innovation’s lesser known sibling:** Entrepreneurship often involves innovation but innovation does not always involve entrepreneurship. Simply defined, entrepreneurship is the mindset and skillset that transforms an innovative idea into an opportunity to create value. In the private sector, value is easily understood as “economic” value. In government, it is often defined as social value (e.g., less gang violence) and in the military, such value can be defined in a number of ways, such as superior communications, faster time to a field hospital for wounded soldiers, or Mine Resistant Ambush Protected vehicles to the theater faster (due to an innovation in the acquisition process) that decrease injuries and fatalities and allow more effective operations to be conducted.

The winners in innovation seem to understand that great ideas are not the same as great opportunities. Real opportunities are rare and “like bees to honey, they draw people and money.” Successful entrepreneurs are often successful because they have the desire and discipline to find out if their innovative idea is also an opportunity. They will often reshape and transform their initial idea until it starts to look, smell, and feel like an opportunity. Idea generation is the fun part but determining whether an idea is actually an opportunity is where the fun stops and the hard work begins. IBM, IDG, and other innovation winners

know that innovation must be enabled by entrepreneurial processes or ideas remain just that – ideas. IBM for example has a very well developed sifting and vetting process for taking the thousands of ideas that they generate in their worldwide innovation jam and narrowing them down to a few that represent high potential opportunities.

One approach, as experienced entrepreneurs well know, is to keep the cost of developing new ideas into opportunities very affordable. One example is IDG which funds a lot of their internal entrepreneurs with small amounts of seed capital to see if an idea has opportunity characteristics. They follow the motto “pay a little, learn a lot.” IDG books gave John Kilcullen, one of their new young entrepreneurially oriented managers, \$1.5 million in seed capital to see if his crazy idea about Books for Dummies had any traction. Most at IDG were against the idea, but that very small amount of seed money turned into a billion dollar franchise.

5. **Not invented here:** Proctor and Gamble (P&G) is arguably one of America’s most innovative companies. From Iams pet foods to the Swiffer mop, they keep coming up with great new products. But in the 1980’s they started to lose their innovative edge. Sales were flat and no new \$100 million products were coming out of their research and development (R&D) folks. They did as you would expect and went through a heavy press on cost cutting and while this helped their profit margins, it did nothing for their inventiveness. They then did something that we often recommend to our clients and that is, a postmortem of their innovative winners and losers. For P&G this led to a dramatic realization that they were so focused on making little changes in their current brands that they had become increasingly internally focused, thus missing external trends and opportunities that they could leverage for greater growth.

When P&G finally woke up, they realized that relying on themselves and their own internal R&D staff had cut them off from a world of ideas and partners who could help accelerate their innovation

way beyond their own capabilities.

Today, P&G’s motto is “proudly not invented here.”

The idea of “proudly not invented here” is at the heart of the Open Innovation movement which has not only paid off handsomely for companies in the private sector but also for governmental organizations as well. Both NASA and the CIA have used open innovation to help debug and enhance some of their internally developed software which they give away free as long as the users help them with both debugging and enhancement. But as we said at the beginning of this article, it takes more than a wide net to be truly innovative. ■



Ready to step up your fishing game?



SOCIAL TECHNOLOGIES: CONNECTING GOVERNMENT AND CITIZENS FOR OPEN INNOVATION

John Ohab, Ph.D. – New Technology Strategist, OMNITEC Solutions Inc., in support of Defense Media Activity

The Library of Congress recently added to its collection a digital archive of every tweet posted on Twitter since the service launched in March 2006. That's a lot of data, and with tens of millions of new tweets every day, the collection isn't getting any smaller. Skeptics may question the value of having the government catalog billions of inane comments about last night's *Desperate Housewives* or the latest Justin Bieber song; but researchers may view this as an opportunity to examine the socio-political contexts of the 21st century's trendiest technology. For now, the debate about how the information will be used is trumped by what this move represents: another acknowledgment by the federal government that information is more valuable when it is available and accessible, free to be reworked, repackaged, mashed up, analyzed, and processed through the Open Innovation (OI) mill.

Providing enormous datasets for the public is only one part of President Obama's nuanced plan to establish a more transparent, participatory, and collaborative government. Data.gov, one of the flagship websites of the Open Government Initiative, has already provided the public with access to over 250,000 government datasets. To maximize the value of this data, the government will rely on web and mobile developers to create a wide variety of applications, mashups, and analytical tools. In the past year, Data.gov has returned applications ranging from visualizations of national obesity trends to flight scheduling tools to the distribution of hazardous waste facilities. The government will need to continue to inspire citizen participation and build incentives for more widespread use of this data.

Social technologies will play

a critical role in engaging the new and diverse audiences needed to translate raw government data into meaningful applications. Already, blogs, wikis, social networks, and other social technologies function as enablers for OI across the government. This paper explores the important role of social technologies in three key areas: crowdsourcing, intra-government collaboration, and citizen science.

Crowdsourcing

The federal government has traditionally sparked innovation from external audiences through grants and contracts. However, emerging social technologies are now enabling governments to distribute problems to a diverse array of solvers in the public, driving innovation from unexpected sources. The General Services Administration (GSA) deployed a government-wide public

dialog tool, IdeaScale, to provide citizens with a forum to share, discuss, and vote on ideas for agency Open Government Plans. The Better Buy Project, an experimental collaboration effort sponsored by GSA, employs a similar crowdsourcing tool, UserVoice, to generate public dialog for ways to improve the federal procurement and contracting process. The Better Buy Project is unique in that the top ideas are imported to a public wiki, where visitors can contribute market research and define requirements. Importantly, social technologies like IdeaScale, UserVoice, and others, provide real-time feedback that can be harnessed for rapid idea generation and organization.

Prizes and challenges have also become an increasingly popular mechanism to inspire creative ideas from the public. The U.S. Army and the U.S. Department of Agriculture recently held their first application development challenges, “Apps for the Army” and “Apps for Healthy Kids,” respectively, which offer cash prizes for innovative mobile or web applications. NASA’s Pathfinder Innovation Contest challenged the public to develop their own casual games that could be used by NASA in future crowdsourcing projects. The Environmental Protection Agency holds numerous video contests on YouTube to encourage students and others to develop public service announcements for environmental stewardship. These are just a few

examples of how the federal government is embracing the notion that the best ideas don’t always come from within.

Collaboration

Government agencies are often criticized for not communicating efficiently, but advances in social technologies have enhanced the speed, scope, and reliability of information sharing. Starting with the launch of Intelink, a continually evolving suite of collaborative tools for the intelligence community, several agencies have followed suit with their own Wikipedia-like services, including the DoDTechipedia, the State Department’s Diplopedia, and the FBI’s Bureaupedia. More recently, the Office of the Director of National Intelligence’s A-Space and NASA’s Spacebook have provided a Facebook-like social networking platform for large-scale collaboration and information sharing. In the fall, GSA will take things one step further with FedSpace, a secure collaboration service that is intended to connect all federal government employees under one Web 2.0 umbrella.

Emergency management stakeholders are experiencing first-hand the benefits of “many-to-many” communication. During the Gulf Coast oil spill, for example, emergency response officials shared geospatial data and coordinated responses through VirtualUSA, a

Department of Homeland Security initiative. VirtualUSA integrates existing frameworks and technologies, rather than inventing new ones, so federal, state, local, and tribal first-responders can communicate in real-time regardless of platform or software. Notably, VirtualUSA uses open-source software and is user-driven, accepting contributions from anyone with information about water and power lines, traffic, weather, and other critical assets.

Immersive environments are also proving to be an effective mechanism for cross-government collaboration. Several federal agencies are joining forces to launch the vGov virtual worlds’ project, which will provide a government-wide secure virtual world environment that can support meetings, training, and networking areas. Government employees, appearing as their favorite avatar, will have access to Voice over Internet Protocol, instant messaging, video conferencing, and other collaborative tools.

Citizen Science

Government agencies are increasingly looking to the public to observe, record, and contribute data to scientific research. Known as “citizen science,” this growing field enables individuals with or without scientific training to take part in research that ranges from water chemistry testing to wildlife monitoring to distributed computing. Many of these citizen science

projects combine large-scale human observations with emerging social technologies, providing a mechanism to test innovative ways of gathering and analyzing scientific data.

The U.S. Geological Survey recently launched its Twitter Earthquake Detector, a program investigating how social technologies can be used to gather and provide information about earthquakes. The system gathers real-time, earthquake-related tweets from people who have experienced a seismic event, and applies place, time, and keyword filtering to rapidly deliver earthquake products and hazard information.

The National Science Foundation (NSF)-funded project, "What's Invasive?" invites anyone with a GPS-

enabled smartphone to make geo-tagged observations and take photos of invasive plant species in parks. Once invasive plants are identified, relevant information is placed on publically accessible map to alert Park Rangers. NASA, a stalwart in the field of citizen science, recently partnered with Microsoft for the "Be a Martian" project, which enables web users to assist astrophysicists in developing comprehensive maps of the Martian landscape. The project represents an innovative fusion of cloud computing, scientific collaboration, and crowdsourcing, as well as principles of social gaming – participants are rewarded game points for counting craters and assisting in various research tasks.

General George S. Patton once said, *"If everyone is thinking alike, someone isn't thinking."* As technology continues to infuse virtually every aspect of society, the federal government will increasingly rely on these innovative thinkers – from both internal and external audiences – to develop solutions that make the government more efficient and effective. Whether virtual worlds, social networks, or public feedback, social technologies provide a new conduit to connect innovators with the information, resources, and stakeholders necessary to translate ideas into meaningful applications. ■

Social Technologies: An Online Laboratory for Experimentation																	2				
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Dr. Ohab collected the logos from several social media websites and embedded them into the periodic table to illustrate the use of social media technologies as an online laboratory for scientists.

GAMING FOR INNOVATION: AN OPEN SOURCE APPROACH TO GENERATING INSIGHT

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By now, most people recognize online scenario-based games as a realistic, convenient, and affordable way to give our service members an opportunity for training prior to a real mission. The Army, in particular, has demonstrated its faith in the gaming environment, and actively uses games like America's Army, Full Spectrum Warrior, and others to provide an effective training experience. The Army has spent millions investing in new gaming technologies, with scenarios that replicate real-world environments, all while being packaged in a mobile platform that allows training to happen anywhere and anytime. To see the DoD-wide acceptance of gaming as a means of training, one need only spend a day strolling the aisles at I/ITSEC: a joint industry, academic, and inter-service event, and billed as "the World's Largest Modeling, Simulation and Training Conference," which has held a number of serious games showcases and challenges in recent years.

Departing from the training paradigm, the Office of Naval Research, is exploring the

emergence of online gaming as an open source platform for insight generation, i.e., "Gaming for Innovation." Today in the Navy, activities like innovation gathering, brainstorming, strategic planning, wargaming and concept generation still typically take place around a table, in a room populated by experts who are drawn from a largely static pool. The resultant intellectual content is injected into a standard Microsoft Office document, and this becomes the final deliverable. While the

"One thing a person cannot do, no matter how rigorous his analysis or heroic his imagination, is to draw up a list of things that would never occur to him."

– Thomas Schelling

traditional methods still provide value, we wanted to explore ways that would revitalize these activities while creating opportunities to expand the participant pool and harness the breadth and depth of knowledge that is inherent in all of our naval service members and civilians. This article is intended to give you insight into what has inspired us to explore this path and where we are headed.

Acknowledging the benefits

of scale achieved by Massive Multiplayer Online Games, industry has been utilizing the gaming platform for quite some time. From alternative reality and scenario based games like Institute for the Future's (ITFs) "World without Oil," to more text based games like IBM's "Innovation Jams," there is no question amongst the companies orchestrating these events that gaming is truly a revitalized approach to harvesting the insights from collective intelligence.

In World without Oil, players were asked to imagine what their lives would be like in a world deprived of petroleum. This serious game resulted in participants contributing over 1,500 personal blog entries, videos, voicemails and images; tapping into the collective imagination of over 2,000 active players in a small window of time. In a different setting, IBM's Innovation Jam brought together more than 150,000 IBMers as well as thought leaders from academia, government, and other corporations to produce more than 37,000 fresh ideas. The outcome of this extra large brainstorming session was an innovative and open approach

to mining for new business opportunities. IBM leadership incentivized their participant pool with over \$100 million in follow-on funding for the strongest ideas.

More recently and closer to home, is a game called “Sigtific.” Sponsored by the Director Defense Research and Engineering (DDR&E), and developed by the IFTF, Sigtific is a massive multiplayer forecasting game that uses immersive alternate reality techniques to generate vivid stories and social predictions. The Sigtific Platform is designed to engage the global scientific community in anticipating the most important innovations and disruptions in science and technology – and understanding their implications for the future of society at large. It stands at the leading edge of several trends that promise to reshape the practice of science in the coming years. Via the same open-source approach discussed above, DDR&E and IFTF collect, aggregate, and process individual signals about potential scientific innovations, and turn them into forecasts and larger scale narrative threads.

Games are emerging as an object of serious consideration for a number of reasons:

- Because they are scenario based, and involve some form of perceived competition, they tend to engage

peoples’ imaginations in ways that traditional methods simply can’t.

- By massively scaling up the size and diversity of the participant pool, they enable the emergence of outlying thoughts, which may be statistically insignificant but turn out to be strategically relevant.
- Being played collectively, they offer an unprecedented opportunity to drive more “knowledge accidents,” those novel intersections and complex interactions of ideas which would not occur and which we would not be able to predict by using traditional methods.
- Because they exist online, and can even persist and evolve over time, they increase the range of possible scenarios that can be explored, resulting in a greater tolerance for iterations and excursions from the base case.
- Finally, online games offer the ability to do all of this remotely, thereby radically reducing the overhead costs and other “barriers to entry” traditionally associated with conducting a large scale, scenario based collaborative event.

While training has, until now, been the most common application of serious games,

we envision turning the training paradigm on its head to accomplish something even more powerful for the Navy and Marine Corps. The game based training paradigm assumes that the game sponsor possesses a finite and specific body of knowledge that the player does not possess. The sponsor transmits this knowledge by means of a scripted, largely deterministic game. In this model, the trainer is the sole proprietor of intellectual capital.

In contrast, we envision using serious games in situations where the game sponsor is struggling with a truly difficult challenge, does not have all the answers, and needs to transcend his usual ways of knowing. In this situation, the intellectual capital is now supplied by the broader community “out there,” but it exists in the form of unrealized potential. By structuring the problem in the form of a less deterministic, less scripted game, and opening it up to a large pool of interested participants, serious gaming provides a forum by which the broader community can engage with the problem, and the mechanism by which this previously unrealized potential can now emerge to become true insight.

With this in mind, the range of potential uses for serious gaming, then, becomes limited only by the user’s imagination, but some obvious ones include:

- Introducing a game changing technology to a community of users;
- Ironing out the interface between Concept of Operations and technology;
- Inhabiting alternative futures for strategic planning;
- Red teaming;
- Technology forecasting;
- Rapid prototyping;
- Wicked problems;
- Regulatory and policy development.

In this context, the use of serious games to generate insight can be viewed as one more mechanism for open source innovation. And while serious gaming itself may not constitute “the next big thing”

it may offer one of our best hopes for arriving at “the next big thing”.

Ultimately, we see on the horizon an era of ubiquitous gaming: gaming as learning, gaming as planning, gaming as an integral part of our everyday work. In the not too distant future, the average person, faced with a hard problem and the need for insight, will be able to author a game, put it out to a large pool of players, and generate insights as easily as he creates a PowerPoint presentation or a YouTube video today.

ONR is exploring this emergent technology by sponsoring a pilot demonstration, known simply as the Massively Multiplayer Online Wargame Leveraging the Internet (MMOWGLI) (pronounced just like the character from The Jungle Book). MMOWGLI is a joint venture between the

Naval Postgraduate School and the Institute for the Future. It seeks to integrate elements from Massive Multiplayer Online Games, Alternate Reality Games, large-n text based collaborative events, geospatial mapping tools, and Web 2.0 collaborative tools, and extend them to scenarios of interest to Navy and Marine Corps. Ultimately, we recognize that there are untapped ideas in the minds of our service men and women, regardless of rank, age, skills, and organizational background, and we are determined to use gaming as a means of accessing this body of knowledge. It is imperative that we put our heads together collectively to think about and prepare for the Navy of the future. MMOWGLI is scheduled to go live in the Spring of 2011, so stay tuned and when that time comes around we hope you’ll join us in gaming for innovation. ■

OPEN INNOVATION: A GENERAL UTILITARIAN VIEW AND SPECIFIC LESSONS LEARNED

Jason Stack, Ph.D. – ONR Program Officer, Ocean Battlespace Sensing

The mission of the Department of Defense (DoD) is fundamentally different from that of industry; however, *how* DoD achieves its mission is the same – better, faster, and cheaper. In DoD terms, this translates to delivering improved warfighting capabilities with increased transition speed at reduced total ownership cost. There is a growing consensus within industry and academia that the most significant innovations contributing to these general

goals will be innovations in business processes not in technology. These process innovations must contain some level of “openness” due to the global nature of business and the exponential growth rate of information. The question then becomes “what should this open innovation entail?”

Successful open innovation requires three activities: **open business, open architecture, and rapid technology insertion**. While overused,

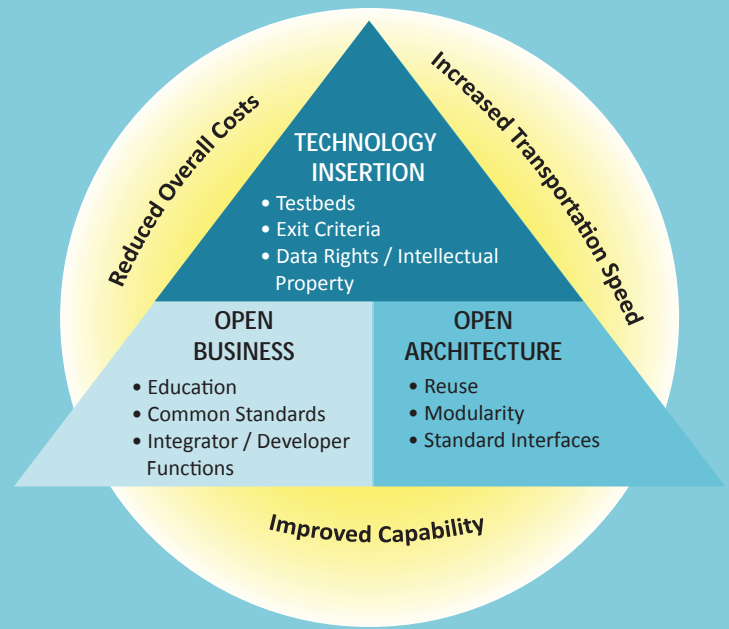
misunderstood, and often misrepresented, these three buzzwords embody foundational concepts that are required for innovating better, faster, and cheaper in today’s environment. Unfortunately, the majority of published material in DoD espousing these activities focuses on compliance with DoD mandates rather than providing any substantive guidance on what these activities actually entail or best business practices for how they may be effectively

employed. Therefore, the following discussion illustrates these three activities and highlights their critical components; these activities and their components are integral to open innovation regardless of problem domain, hardware vs. software, or business sector. Finally, examples of lessons learned are provided from the naval mine warfare (MIW) community. While not a large or glamorous warfare area, MIW's agile, well-defined, and cohesive community has afforded it the opportunity to prototype and successfully implement a wide array of open business, open architecture, and rapid technology insertion initiatives.

The goal of **open business** is to maximize the viable performer base by broadly leveraging relevant technologies and expertise from other sectors. The three critical components are education, common standards, and separating the functions of integrator and developer. A powerful approach for enabling education and common standards is the Community of Interest (Col). This approach was employed by the MIW Col, which first met in May 2006 and was chartered in April 2008. It pulled together experts from across the Naval Research Enterprise to author and publish domain-specific data models (e.g., mine-like contacts, plans, and environments), a sensor format data specification (e.g., imaging sonars), and developer guidance (e.g., search theory, algorithm descriptions, and evaluation techniques). A key factor enabling this substantial progress in such a short time

was a strategic selection of membership emphasizing those with actual stewardship over the processes. In general, a Col must effectively balance the needs of the community against compliance with higher-level DoD and industry standards. It must constantly revisit and ensure membership breadth when prioritizing the next set of data products to be standardized. Web-based collaboration tools such as Wiki's, SharePoint, and Defense Connect Online may be used to host information and facilitate collaboration. For MIW, this has resulted in academics from operations research (with no prior MIW experience) being rapidly and affordably educated in the relevant MIW processes and subsequently developing specialized, state-of-the-art approaches in task decomposition, asset allocation, and scheduling software.

The goal of **open architecture** is to minimize the cost and effort associated with technology upgrades and insertion. Its three components are modularity, standard interfaces, and component reuse. The challenge for achieving modularity within software begins with ensuring separation of application, data, and presentation layers. The challenge for hardware is often more complicated



as the contributing factors includes size, unit cost, number of potential developers, and pace of technology evolution and obsolescence. Translated to the Program Manager, the challenge is to balance sufficient openness (thereby promoting innovation and affordability) against too much parsing of the system, which can lead to program cost increase and unattractiveness to potential developers. An approach for testing open architecture used in many sectors including MIW is to enlist an independent third-party agent (ideally one with no prior knowledge of the system or its modules). This agent serves as a surrogate system integrator by integrating a previously unseen module into the system while tracking metrics such as hours of support interaction with the developers, minor system tweaks, major system modifications, and total integration effort. Within MIW, use of this test has resulted in an early, clear, and affordable means to confirm and debunk

claims of open architecture and provide feedback for architecture improvements in multiple systems. Further, it has proven to be an exceptionally powerful tool in uncovering problems in business strategy, contracting language, and data rights.

The goal of **rapid technology insertion** is to minimize the distance between the worlds of development, prototype, and production. Its critical components include test beds, exit criteria, and management of data rights and intellectual property (DR/IP). Test beds are a cornerstone of open innovation, and when properly designed they are a core enabler of making technology insertion rapid. The challenge in making a test bed effective

“The goal of open business is to maximize the viable performer base by broadly leveraging relevant technologies and expertise from other sectors.”

is to give potential developers (not only the integrator) the ability to insert their own modules, continuous access to the results and effects, and the encouragement to test early and often. The challenge in increasing the speed of transition is to make the test-bed as similar as possible to the actual systems employed by the end user. This is essential in preventing developers from building their own ad hoc test-beds and thereby guessing and fabricating the nuisances associated with user processes, available

data, formats, and interfaces. The challenge with DR/IP management is that this area is fraught with misconception and misinformation. It is a common yet incorrect statement that government should “always strive for at least government-purpose rights.” To support open innovation the government should always strive for the *most appropriate* data rights – this implies the government does not always have free rein over everything it uses but rather leverages other technologies as appropriate. One approach within MIW concerns the need to use sonar to look for things in the ocean. This need is shared by other industries including petrochemical, archeology, geology, salvage, fisheries, etc. Therefore, some systems are *licensed* with restricted data rights and no government-owned IP; some are jointly developed with government-purpose data rights and mixed IP ownership; and some (truly unique to DoD) are fully developed and wholly owned by the government. The result within MIW has been to force an overt and upfront strategy to address these issues leading to cost savings and avoidance of non-trivial issues in system architecture, contracting, ownership, and future strategies for competitive procurement.

In summary, enabling open innovation requires the government to foster several components within the activities of open business, open architecture, and rapid technology insertion. This effort goes far beyond simply

demonstrating compliance with high-level mandates and generating reams of documentation. In fact, there are many communities in DoD demonstrating progress in open innovation and sharing their lessons learned. However, there are substantial barriers to open innovation; the two most significant are DoD’s information assurance (IA) posture and the widget-centric (vice capability-centric) budget structure. Within the Navy, the budget issue must be addressed by increasing coordination between the warfighter, acquisition, requirements, and science and technology. For example, the Navy has revised the Concept Generation and Concept Development process in an effort to streamline ideas into concepts and then from concepts, into actual capabilities via a Navy-wide coordinated and collaborative process. As an example of working within IA constraints, the MIW Col is teaming with the Anti-Submarine Warfare Col and the Naval Postgraduate School to explore web-based collaboration, educational approaches, and processes for rapid technology insertion. Finally, the ONR Office of Innovation is pursuing ways to harness input from technology users by hosting a Technology Innovation Game and a Massive Multiplayer Online Wargame in 2011. These are just a few Navy efforts that are currently underway to maximize open business opportunities, minimize the costs and efforts associated with open architecture, and rapidly inject new technologies into the hands of the warfighter. ■

THE INNOVATION IMPERATIVE

Brian Clark – Strategy Branch Head, Navy Warfare Integration (N00X)

The last 100 years of naval operations have seen enormous change and innovation. At sea, sail gave way to steam, then nuclear power, and now hybrid-electric drive. Battleships went from capital ships to supporting platforms, while aircraft carriers became the centerpiece of naval power projection. A fleet of 140 ships in 1900 grew to more than 6000 during World War II, only to shrink to less than 300 today. Meanwhile, sailors now spend more time in the air or on shore than during the 1940s, as the number of people in the Navy changed from less than 900 per ship to more than 1200 today.

Each of these major changes grew out of a combination of technology and new operational or organizational concepts. None were a function of technology alone. We often associated “innovation” with new advancements like the personal computer, mobile phone or iPad, but none of these innovations really took off until there was a new way of operating that took advantage of them.

Clayton Christensen, in *The Innovator’s Dilemma*, points this out using the example of the computer hard drive industry. While hard drive manufacturers were able to make smaller and smaller hard drives, their mainframe computer customers weren’t interested in them because they didn’t need small size and didn’t want the reduced storage and lower reliability that came

with these drives. Only when the new MP3 player utilized these smaller hard drives did the combination of technology and operational concept result in innovation.

The Navy has faced similar situations. The advent of nuclear power in the 1940s didn’t mean much until Hyman Rickover worked to combine it with submarine propulsion to allow indefinite submerged operations. The introduction of more powerful aircraft engines in the 1920s didn’t revolutionize warfighting until the Navy tapped into that power to allow aircraft to fly from the new flight deck of the USS Langley.

Collaborate, or Fall Behind

Today, the Navy must continue to apply the technologies being developed at research facilities around the world to the operational challenges of today. This is only possible, though, if technologists and fleet operators communicate, collaborate and experiment with their ideas. The Office of Naval Research (ONR) aggressively pursues these interactions, and their efforts at “open innovation” will further increase opportunities for collaboration between operators, scientists, and engineers. Turning collaboration into innovation, though, will require support from the fleet and the Pentagon. To help institutionalize a process for turning ideas into innovation, the Navy Warfare Development

Command and N00X are coordinating an Innovation Council of Captains (ICoC) where technologists, concept developers, resource sponsors and operators will gather monthly to review innovation efforts and identify where new opportunities for improvement exist.

The ICoC will review concept ideas as part of the CNO’s new Concept Generation and Concept Development (CGCD) process. This process provides a method for new warfighting ideas to be proposed by operators and technologists for direct consideration by the Navy’s four-star leaders. Currently the ICoC is developing the concept ideas approved by CNO in the Navy Strategic Plan for FY12, and in the future, the ICoC will review and develop concepts generated from throughout the fleet.

In addition to creating a process for new concept ideas to be generated and developed, we must continue the effort begun by ONR to foster a wide variety of venues that highlight the confluence of technology and operational art. For example, wargames have long been a means by which operators think through how they might solve a future operational challenge. By bringing these operators together with technologists in an innovation game, we can explore how science and technology may address future challenges when combined with new operational concepts or principles. We in OPNAV are

working with ONR to conduct a Navy Technology Innovation Game within the next year.

The Budget Dilemma

It is hard to read any national publication today and not be assaulted by dire predictions for both federal budgets and the national debt. Secretary Gates spoke emphatically at the Air-Sea-Space Symposium and Eisenhower Library in May 2010 about the need to contain costs, reduce overhead and become better stewards of taxpayer money. At the same time, the demands on naval forces are growing and will continue to expand as our ground forces draw down in Iraq and Afghanistan. While our troops are resetting at home, naval forces will be called upon to maintain stability and security in the Middle East, Pacific, Africa and elsewhere. Innovation has a central role in both improving our efficiency in meeting these demands and improving the credibility of the forces the Navy and Marine Corps bring to bear.

Efforts at corrosion control, automation, and unmanned and remotely piloted systems will

make each of our fleet units able to impact larger areas for longer periods of time while staying within future cost constraints. New technologies such as laser weapons and improved electronic warfare will be essential to the combat credibility of future flights of ships such as LCS or DDG-51 – an important attribute for ships that will increasingly have to operate independently in denied or uncertain environments.

Shortchanging our science and technology investments will only make the future fleet less able to provide the widely distributed, forward deployed combat capability required to address irregular and anti-access threats facing our nation. We must ensure, though, these investments continue to address areas that could be future operational problems or technology surprises, while also serving national priorities for advancing science and technology. Establishing the right priorities and emphasis in research funding is itself a collaborative effort, where operators, scientists and engineers must continue to work so the next generation can benefit from the combination of technology and concept. ■

OFFICE OF NAVAL RESEARCH MARKS 50TH ANNIVERSARY OF LASER TECHNOLOGY

Article contributed by ONR Corporate Strategic Communications

From scalpels to corrective eye-surgery to weapons, laser technology has advanced from scientific curiosity to scientific fact since receiving its patent on May 16, 1960. The Office of Naval Research (ONR), which has made investments in the research and development of the laser, is joining the science community as it marks the 50th anniversary of this groundbreaking device.

“ONR’s contribution to the invention of the laser is well known,” said Dr. Lawrence Schuette, who heads ONR’s Office of Innovation. “We sponsored the Shawanga quantum electronics

conference that brought laser physicist-inventors together to brainstorm the technology in 1959. ONR is proud of the record of inventions and innovations in laser technology that spans the past 50 years. One can only imagine what we’ll sponsor in the next 50 years.”

Researchers at ONR are applying laser technology in naval maritime defense. The Navy and Marine Corps’ science and technology provider is developing a laser that promises to change warfighting at sea. Planned for the Navy’s coming all-electric ship, the free electron laser weapon system

has an unlimited magazine depth, precise speed-of-light capability and can engage multiple targets.

ONR also invested in the maser, the precursor technology to the laser, in the late 1940s-50s. Researchers sought a means of using short-wavelength radiation to investigate molecular structure. The result was the maser, or “microwave amplification by stimulated emission of radiation.” Once developed, researchers soon began work on the idea of replacing microwaves with light. The laser and its numerous commercial applications soon followed. ■

NWDC: NAVY'S CONCEPT GENERATION AND CONCEPT DEVELOPMENT (CGCD) PROGRAM

RADM Wendi Carpenter – Commander, Navy Warfare Development Command

The Chief of Naval Operations (CNO) established the Navy Concept Generation and Concept Development (CGCD) Program in June 2008 to provide a collaborative approach and structure for developing new Navy strategic and operational concepts. Commander, Navy Warfare Development Command (NWDC) was designated the Executive Agent for the program. Since the program was established, NWDC has been increasingly engaged with the Office of Naval Research (ONR), partnering for wargames, analytical studies, research, and potential technology solutions to the military challenges and opportunities addressed in the concepts generated within the CNO's program. NWDC's efforts have the same goal: providing the best affordable capabilities to the warfighters to prevent wars or win the wars, if deterrence fails.

CGCD requires a frequent dialogue and close partnership between organizations such as ONR and NWDC. NWDC's concepts address the needs of the Fleet which inform ONR's science and technology and the research, development, test, and evaluation investments to provide the requisite technology solutions to improve naval warfighting.

Concepts are about developing capabilities and the best way to employ them. They serve as a basis to drive required

changes and inform technology development. Our Navy is by nature a capital intensive, platform-centric force. A cultural change is needed to shift our focus to become a capabilities-centric force. Concepts provide a holistic approach to warfighting integration that replaces sub-optimal stovepipes.

CGCD identifies required capabilities throughout the spectrum of operations and provides a sound basis for investment decisions to produce solutions across the Doctrine, Organization, Training, Materiel, Leadership, Education, Personnel, and Facilities (DOTMLPF) spectrum, while considering associated risks and implications.

A concept is a notion or statement of an idea with an expression of how something might be done – a visualization of future operations that describes how a commander, using military art and science, might employ capabilities necessary to meet future challenges and exploit future opportunities. The primary purpose of a concept is to envision new ways of operating, how the force can successfully conduct the described missions, and to define what capabilities are required to deal with today's and tomorrow's naval challenges and avail opportunities provided by changes in the operating environment. It should describe new ways of using technologies

that exist and consider ways of using technologies that are likely to exist.

Some concepts are commonly referred to as "operational concepts." This can be confusing. The term "operational" refers specifically to the operational level of war, but is often used to describe any type of military action. We use the term "operating concept" to refer to the conduct of military action independent of the level of war. An operating concept could be at the strategic, operational, or tactical level.

Operating, functional, and enabling concepts are also distinct from "concepts of operations." A concept of operations (CONOPS) is defined as "a verbal or graphic statement that clearly and concisely expresses what the Joint Force Commander intends to accomplish and how it will be done using available resources..." and it is often associated with a specific warfighting scenario or theater.

Navy CGCD Program Processes

The following figure provides an overview of the basic CGCD process. It is important to recognize the three related, but separate and distinct phases: concept generation, concept development, and implementation of solutions. The process is non-linear and highly flexible.

Concepts inform and support the Navy's Planning, Programming, Budgeting and Execution process. Validated concepts provide valuable and defensible inputs for the development of the Navy Strategic Plan (NSP) and Navy Strategic Guidance (NSG) as well as the Navy Strategic Planning Process (NSPP). The NSP and NSG guides Navy investment decisions, identifies priorities, and critically examines risk in terms of missions.

Concept Generation Phase

The Concept Generation Phase starts with harvesting ideas that will potentially produce new capabilities to address military challenges or opportunities. The process continues until a full concept paper with potential DOTMLPF solutions and a proposed action plan are presented to the CNO for his decision. This ensures that concept development and the commitment of the required resources is undertaken only after the implications and effects of implementing the concept are identified and understood. Concept generation can be initiated by many sources such as (not an inclusive list):

- Capability shortfalls or identified gaps produced by the NSP, NSG, NSPP and other Navy higher authority planning processes
- Doctrine deficiencies
- Introduction of new capabilities / new technology



Navy CGCD Program Processes

- Changes in the operational environment
- Changes in the potential threats
- Individual ideas / Fleet inputs
- Reality of fiscal constraints

The Concept Generation Phase is very much about research, discovery, and defining the operational problem set, the challenges, the opportunities, and the stakeholders and their engagement. It requires understanding the strategic and operational context as defined by *A Cooperative Strategy for 21st Century Seapower* (CS-21), the *Naval Operating Concept*, and the applicable coalition, joint, and Navy warfighting concepts and visions. It includes the harvesting of ideas, the defining of warfighting gaps with associated challenges or opportunities to be addressed, and the definition and exploration of the value and

feasibility of potential solutions.

In the last several years, NWDC and ONR have been closely aligned and partnered in concept generation and development, helping to shape research on potential technology solutions. The importance of this strategic and collaborative approach cannot be underestimated. Accordingly, there is an open invitation for any organization to partner with NWDC and ONR to generate conceptual ideas and drive rapid development of technology that will provide essential capabilities generated through the CNO's CGCD Program. We shape the Command goal of providing the most effective and affordable capabilities to the Fleet.

For more information about NWDC's CGCD program and to contribute your innovative ideas, visit the NWDC website: <http://www.nwdc.navy.mil/#>

INNOVATING TO PROTECT OUR FUTURE

Gary Markovits – CEO, Innovation Business Partners, Inc.

Jim Blesse – Innovation Business Partners, Inc. and ONR Office of Innovation

The Navy's innovation mission is broad and daunting. We must pursue revolutionary capabilities for future forces, mature and transition existing innovations, and respond to current critical needs. In the midst of these pursuits, we must also maintain broad technology investments to anticipate and counter potential disruptive innovations from our enemies.

In the future this mission will become even more daunting if current trends such as the erosion of the U.S. manufacturing base and the decline in our science, technology, engineering and mathematics graduates is not reversed. Six years ago we reached another tipping point. In 2004 more than half of the world's investment in research and development happened outside of the U.S. and our Patent and Trademark Office for the first time ever granted more patents to foreign assignees than to Americans. Compounding all of this is the pace of innovation which is growing exponentially. To protect our freedom and to remain a first class nation we must increase our capacity for innovation and this means we must innovate smarter, not harder.

Innovating smarter does not mean abandoning our classic approach to innovation that has served us well. The scientists of the Naval Research Enterprise (NRE) are among the best in the world. Innovating smarter

means augmenting what we do well today with new ideas, processes and tools that enable us to leverage and benefit from the world's investment in innovation. Open Innovation (OI) is just such a concept.

Innovation in its broadest sense is the process by which we generate new knowledge. It is the process by which we imagine a possible future state, use our science to prove it possible and our technology to make it feasible. More pragmatically an innovation is a novel and non-obvious combination of technology and concepts of operation (CONOPS) that solve a problem.

Historically those novel non-obvious combinations were generated by the NRE's network of researchers. But the NRE cannot employ every bright person in the world. What OI seeks to do is either export our problems to outside research networks for solutions or to import from outside networks the technologies and CONOPS that will enable us to solve the problem.

The Navy has been practicing methods of OI for a long time through programs and organizations such as the Broad Agency Announcements, Small

Business Innovation Research, ONR Global engagements and TechSolutions developments which either export problems or import new technologies and CONOPS from an extended innovation network.

Industry is facing an analogous challenge and in response they have created a panoply of new OI mechanisms embodied in companies such as NineSigma, InnoCentive, YourEncore, MFG.com, Yet2.com and others. Unconstrained by the policies the Navy must conform to, they have created mechanisms focused on producing solutions in the shortest time at the lowest cost.

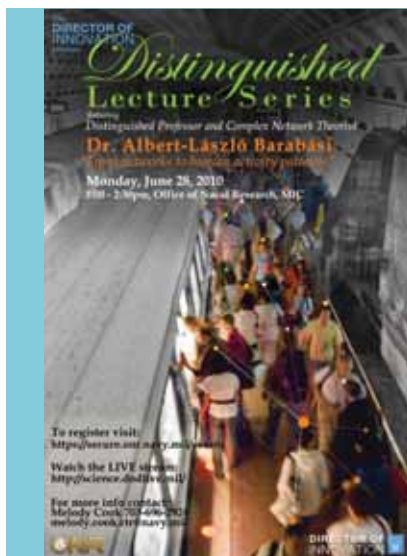
This produces two opportunities for the Office of Naval Research: one, find a way to use the commercial OI mechanisms to solve Navy problems, and two, learn from them and improve our own mechanisms to solve problems faster and deliver more value to the warfighter.

OI is not a silver bullet. It is one more weapon in the science and technology arsenal to help us generate more value for our warfighters, protect our freedom, and keep us a first class nation. ■



Naval S&T Problem Solving Process

UPCOMING EVENTS



Spring 2010 Distinguished Lecture Series: Final Lecture, June 28th, 1:00 pm-2:30 pm

Featuring Professor Albert-László Barabási, Center for Complex Network Research and Departments of Physics, Computer Science and Biology at Northeastern University, and the Department of Medicine at Harvard Medical School

Abstract of his lecture, *From Networks to Human Activity Patterns*:

Highly interconnected networks with amazingly complex topology describe systems as diverse as the World Wide Web, our cells, social systems or the economy. Professor Barabási will discuss the amazing order characterizing our interconnected world and its implications to network robustness and spreading processes. Most of these networks are driven by the temporal patterns characterizing human activity,

ranging from web browsing to mobility patterns. Professor Barabási will use mobile phone data to explore the patterns characterizing these temporal processes, leading us to the question of predictability in human activity patterns.

To attend in person, please register at: <https://secure.onr.navy.mil/events/regdetail.asp?cid=665&code=4>

To stream the lecture LIVE starting at 1:00 pm EST and courtesy of Defense Media Activity, please visit the Armed with Science website: <http://science.dodlive.mil/>

ONR S&T Partnership Conference – August 24th-26th

Mark your calendars for the Office of Naval Research (ONR) Science and Technology (S&T) Partnership Conference at the Hyatt Regency Crystal City, Virginia. The purpose of the conference is to advance awareness of ONR's S&T strategy, programs and research initiatives; to present S&T research challenges and discuss possible solutions; to broaden our S&T partnership base; and to explore new ideas with academia, industry, and government laboratories.

Many of you attended the 2008 ONR S&T Partnership conference – the successful aspects from that conference



will carry over including Code and Director's breakout rooms, Pitch-A-Principal appointments, the Exhibit Hall and our signature Information Exchange. During these varied collaborative opportunities, attendees will meet Business Opportunities staff and ONR program officers to discuss how to work with ONR and to exchange innovative ideas. Also, the Chief of Naval Research (CNR) will continue the tradition of the CNR Challenge, and issue a special \$1 million research challenge. Responses must be submitted in person at the conference, so please consider attending and competing for one of the ten \$100K grants.

To attend, follow this registration link: <http://www.onr.navy.mil/Conference-Event-ONR.aspx> ■

Did you miss the 2010 Navy Opportunity Forum? Visit the website to see the narrative briefs, brochures, and charts for more than 200 technologies developed by small businesses and funded by Navy's Small Business Innovation Research and Small Business Technology Transfer. <http://www.navyopportunityforum.com>

DIRECTOR'S CORNER

Larry Schutte, Ph.D.

The Office of Naval Research (ONR) hosted the second Open Innovation (OI) Summit on 19 and 20 May. During that two day summit, we had the opportunity to explore the OI tools available to organizations as they try to integrate new innovation principals into their business processes. At the same time, we were able to explore how three companies (Eli Lilly, General Mills and Proctor and Gamble) came to use OI tools, the results they have achieved, and the lessons learned. While each company is large and distributed like the Navy, we have one fundamental difference: in the Navy, we don't own the entire business model – the taxpayers do. While I am slightly jealous of the freedom the private sector has in its ability to maximize the business model through OI, I see real opportunity for the Navy to leverage OI across the DOTMPLF (Doctrine, Organization, Training, Materiel, Personnel, Leadership and Facilities).

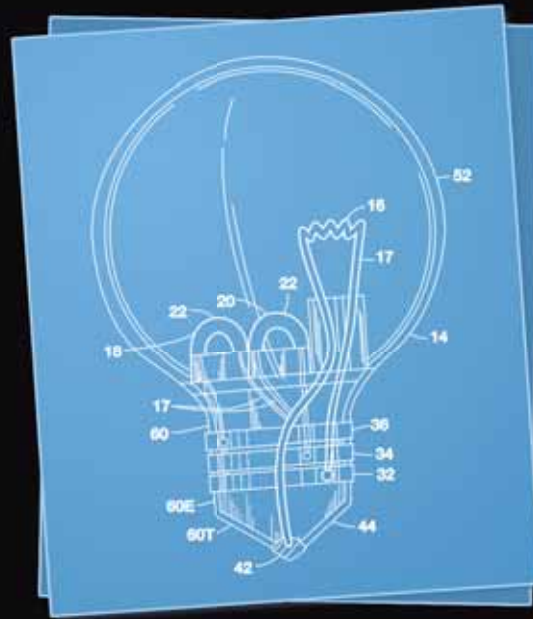
At ONR our main business function is to provide venture capital for Science and Technology (S&T). We are a global organization with offices in London, Singapore, Chile, Tokyo and Prague

(and watch this space for a potential expansion in Asia). Because of our international presence and interests we are able to look across the globe for innovative capabilities to bring to the Naval Warfighter. Honing our S&T portfolio with OI tools is a straightforward proposition and one that we are actively pursuing.

At the end of the OI Summit, I became even more convinced that we need our leadership to communicate the value of innovation in concert and across the entire community responsible to our warfighters. The challenge for the Department of the Navy is to break down cultural barriers and stovepipes and work across the DOTMPLF communities. In this issue of the newsletter we have reached out across the commands and people that we are teaming with in order to bring their perspective on this important issue to the forefront. As we move ONR and the Navy forward with the many initiatives outlined in this edition, I feel confident that OI will bring us closer to the kind organization we hope to be. ■

SOCIAL MEDIA PRESENCE

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	Watch ONR's Distinguished Lecture Series after the Event! http://www.youtube.com/watch?v=tHXD9MYDZHI http://www.youtube.com/watch?v=IGHMM7erXGE



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